

Tulsa Tornado Tribune

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Where People Who Know the Weather Get Their Weather

National Weather Service Tulsa, Oklahoma

Winter 2013-14

Friday, January 10, 2014

A LATE RALLY

For much of the first half of May, the pattern remained unfavorable for severe storms as a blocking high pressure ridge remained over the western U.S. and kept the upper level flow relatively weak for an extended period. A significant shift in the jet stream finally took place toward the end of the month, and the results were destructive and, unfortunately, deadly in some areas. Eastern Oklahoma and western Arkansas were mostly spared the worst, but the last 13 days of the month saw over two dozen tornadoes strike the NWS Tulsa forecast area.



Tornado on the ground near Avant, OK, May 20. Photo by Kelly Baker.

Details about the May tornadoes on pages 2-5



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Editor's Note

The day after the May 20 tornadoes in northeast Oklahoma, I surveyed some of the damage with Warning Coordination Meteorologist Ed Calianese. I thought readers might find it interesting to see what it involves and how we actually go about it.

Craig Sullivan - Editor

Our job doesn't end when storms move out of the forecast area. In the case of a tornado outbreak, a lot of hours are spent studying the event after-the-fact. To put together a comprehensive database of tornadoes, a trained set of eyes needs to examine the damage firsthand and, in some cases, search for damage where a tornado was suspected. Ideally, this would be completed the day after the event. Most of the time, it takes sev-

eral days to finally get the chance to examine each area thoroughly.

May 21...Where to Start

Our first order of business was deciding where to survey first...and how much staff to send out. This depends on how many extra staff are available and if they are needed to work severe weather or perform other duties. Since there was still flooding ongoing in our forecast area, only one team (Ed and myself) went out that day, so we were only able to look at a few of the dozen or so areas of interest.

Deciding where to survey is more involved than just taking a drive to an area where damage was reported. Using archived radar data to examine the mesocyclone track also helps us

ASSESSING THE DAMAGE



Ottawa County barn destroyed by the May 20 tornado.

figure out where to send survey teams.

Our mission is to not only examine the intensity of the damage and assign an EF-scale rating, but also to map out the length and width of the entire tornado path. This involves a lot of driving...usually at low speeds.

Damage Continues on page 6

LATE SEASON RALLY

*Most of May was uncharacteristically quiet.
But, the end of the month more than made up
for the lackluster start.*

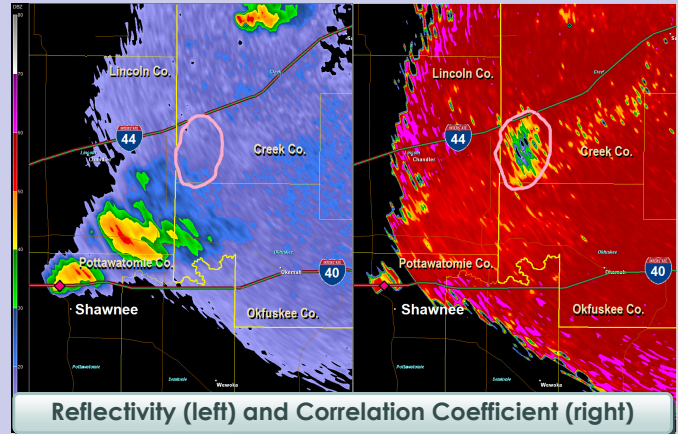
May 19-20

For the first time in several weeks, a strong upper level jet stream punched through the western U.S. ridge by May 18. This set the stage for the first event of the month as very unstable air surged north across the area in response. By the afternoon of the 19th, a dry line became established across central Oklahoma, just west of the Oklahoma City area. Thunderstorms erupted along the dry line during the late afternoon. Very unstable air combined with very strong wind shear allowed these storms to evolve rapidly into supercells, which produced several damaging tornadoes in central Oklahoma before moving into eastern Oklahoma. Most of these supercell thunderstorms gradually weakened as they moved into the eastern portion of the state. The storm that produced a damaging tornado west of Shawnee (Pottawatomie Co.) went on to produce a strong tornado west and northwest of Prague (Lincoln Co.), and another that moved across northwestern Okfuskee County. Another brief tornado touched down northwest of Shamrock in Creek County, but this storm also weakened as it moved farther into northeastern Oklahoma.

The same dangerous atmospheric conditions persisted on May 20. Once again, by mid-afternoon, thunderstorms developed rapidly across central Oklahoma. Within a half hour after the storms formed, the strongest ones began producing tornadoes. A violent, EF-5 tornado devastated Moore, OK...the third violent tornado to hit Moore in 14 years! While eastern Oklahoma again dodged the absolute worst, the storms progressed east and produced several other tornadoes during the late afternoon and early evening. At this time, an outflow boundary left over from the previous night's storms was draped from far northwest Arkansas, through Tulsa, to the Ponca City area. This boundary provided a local enhancement of storm relative helicity, which can help fo-

Dual-Pol Shows Debris

A considerable amount of debris from both the Shawnee and Moore tornadoes was found in portions of eastern Oklahoma, primarily across Creek, Okfuskee, and Tulsa Counties.



The recently installed Dual-Pol capability at NWS radars was able to detect this debris. Analysis of this data, referred to as Tornado Debris Signatures (TDS), indicate that the Shawnee and Moore tornadoes lofted light-weight debris to very high altitudes. These signatures, with low correlation coefficients (CC), were not located in regions of "clear air" radar returns or in areas that would support very large hail (other factors that could produce similar low CC values). There is also continuity between radar volume scans with the area of debris moving northeast into Creek, Okfuskee, and Tulsa Counties. Calculations from the Oklahoma City radar (KTLX) showed debris from the Moore tornado at approximately 40,000 feet about the ground. The Tulsa radar (KINX) shows debris signature heights from the Moore and Shawnee tornadoes in the 30,000-35,000 feet range. If these are indeed debris signatures, this would likely be one, if not the highest altitudes seen since the nationwide upgrade to the Dual-Pol capability!

cus tornado potential. It was in this general area that most of the tornadoes developed (see page 4). Later in the evening, a line of severe thunderstorms moved across far eastern Oklahoma and into western Arkansas. This line contained bowing segments that produced damaging straight-line winds and several tornadoes.

More storms formed near the cold front from southwest through central Oklahoma during the night. As the front

Late Rally Continues on page 3

LATE RALLY (Continued from page 2)

slowly moved south and stalled briefly near the Red River the next day, thunderstorms continued to develop along and north of the front. Winds aloft were nearly parallel to the front, leading to training of storms and a swath of heavy rain in southeast Oklahoma. Two-day rainfall totals across southeast Oklahoma and west central Arkansas ranged from about 2.5 to 7.5 inches, including a maximum of 7.8 inches 4 miles WNW of Daisy, OK. All of this rain led to widespread flash flooding and moderate flooding along the Kiamichi River near Antlers.

May 29-31

*See Page 5 for details
on the tornadoes*

The blocking high became established to the west again toward the end of the month. However, a similar set-up was about to take place to close the month as once again a strong Pacific jet punched through and took aim at the southern plains. With the atmosphere fully “re-loaded” and a dry line and frontal boundary in the vicinity, another round of severe thunderstorms developed during the afternoon and evening hours of May 29th over central Oklahoma. The severe storms moved into eastern Oklahoma and northwest Arkansas late that evening, producing damaging winds and large hail, along with heavy rain northwest of Interstate 44. Mainstem river flooding occurred along Bird Creek, the Caney River, the Verdigris River, and the Neosho River.

The front stalled across the region, and conditions across the area remained very unstable the next day, May 30. Additional severe thunderstorms developed over central and eastern Oklahoma, as well as in northwest Arkansas, producing very strong winds and large hail, along with several more tornadoes. Most were brief and did little damage... however a strong tornado struck parts of Broken Arrow, OK. While rainfall on the 30th was generally less than 2 inches, heavier amounts of 3 to over 6 inches fell in southern LeFlore County, with a majority of it falling in the 6-hour period from 9pm to 3am. This rain led to extreme flash flooding, with nearly 5 feet of water reported in some homes, several bridges washed out, and numerous roads and culverts with damage.

The final round of severe weather and flooding struck on May 31 into the very early morning of June 1. Thunderstorms initially developed across central Oklahoma along a cold front and dry line before tracking northeast during the afternoon and evening. Several rotating supercell storms affected eastern Oklahoma, producing several more weak tornadoes. Two minor injuries occurred when a twister destroyed a mobile home near Watova, OK.

The big story of the evening was again in central Oklahoma, when a long-lived HP supercell brought a deadly tornado and widespread flooding to the Oklahoma City area, before moving east along Interstate 40 into eastern Oklahoma. While this cell did not produce tornadoes in eastern Oklahoma, the slow moving storm remained an extremely prolific

rain producer. Widespread totals of 3 to 8 inches of rain fell over Okfuskee and McIntosh Counties, as well as portions of Okmulgee, Muskogee, Pittsburg, and Haskell Counties. This heavy rain resulted in widespread flash flooding, and unfortunately, one fatality occurred when a 69-year old woman drowned after her car was swept into Alabama Creek about 5 miles south of Clearview, OK (Okfuskee Co.) just after midnight. A teenage passenger was able to escape through the vehicle’s sunroof.



Flooding in the Henryetta area May 31-June 1. Photo courtesy of The Henryettan.

Okfuskee County Emergency Management reported that 20 people were evacuated from Weleetka on June 1 due to flooding. Also, several roads and bridges were damaged. Okmulgee County Emergency Management reported approximately 25 homes and one nursing home were evacuated in Henryetta due to flooding from Coal Creek, which, according to local media, spread out over 100 yards wide above the embankment. At least 50 more homes were affected by the flooding in nearby Dewar. Water rescues took place in both communities, and many roads were barricaded due to high water. ⚡

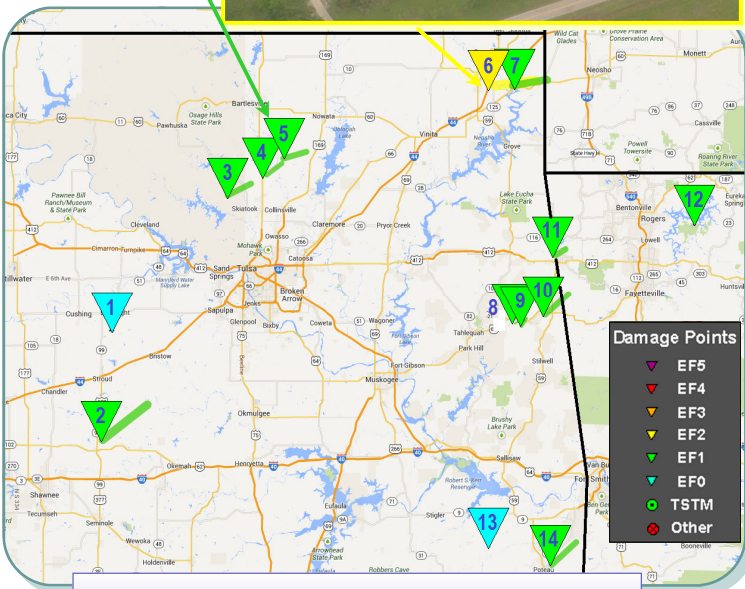
Confirmed Tornadoes May 19-20, 2013

Time	County	Location	Length	Width	Wind	Remarks
May 19						
1 647 pm	Creek	2 NW Shamrock	0.2 mi	50 yd	75 mph	Chaser video; no known damage
2 720 pm	Okfuskee/Creek	4.2 NW Paden - 3.3 NW Welty	12.3 mi	700 yd	110 mph	Continued from Lincoln Co. Barns damaged; trees snapped/uprooted
May 20						
3 351 pm	Osage/Washington	5 SSW Avant - 5.2 WNW Vera	6.5 mi	500 yd	110 mph	Home damaged; trees snapped/uprooted
4 412 pm	Washington, OK	3 SE Ramona - 5.2 E Ramona	4.5 mi	400 yd	105 mph	2 homes damaged; trees snapped/uprooted
5 433 pm	Washington/ Rogers	5.8 ENE Ramona - 3.4 NNW Talala	6 mi	500 yd	105 mph	1 home and barn damaged; path based on spotter reports/video
6 625 pm	Ottawa	4 N Fairland - 4 NE Wyandotte	10 mi	800 yd	125 mph	Metal shop building and several homes severely damaged
7 632 pm	Ottawa, OK/Newton, MO	2.8 NW Wyandotte, OK - 0.5 SE Seneca, MO	8.5 mi	600 yd	110 mph	Several homes, barns, outbuildings damaged; trees snapped/uprooted
8 632 pm	Adair	1.7 SE Proctor - 2.8 E Proctor	2 mi	150 yd	105 mph	Trees snapped/uprooted
9 635 pm	Adair	2.5 SW Christie - 1 NW Christie	2.5 mi	300 yd	110 mph	Barns damaged; trees snapped/uprooted
10 640 pm	Adair, OK/Washington, AR	2.7 WSW Christie, OK - 1.6 N Cincinnati, AR	8 mi	500 yd	110 mph	2 barns destroyed, 1 damaged; trees snapped/uprooted
11 649 pm	Benton	1.8 NW Siloam Spgs. - 2.5 NE Siloam Spgs.	2.9 mi	500 yd	95 mph	Minor damage to several homes
12 724 pm	Benton	7.5 SE Prairie Creek - 7.8 ESE Prairie Creek	0.8 mi	270 yd	100 mph	1 home, several boat docks damaged; trees snapped
13 833 pm	LeFlore	5.9 SW Bokoshe - 5.2 SW Bokoshe	0.7 mi	260 yd	70 mph	Law enforcement reported; minor tree damage
14 844 pm	LeFlore	5.1 SSW Cameron - 3.6 ENE Cameron	8.5 mi	500 yd	90 mph	Minor roof damage to 1 home; trees uprooted



Left: Tornado on the ground northwest of Talala, OK on May 20. This tornado (number 5) was witnessed by a number of chasers over open country and was associated with the same supercell storm that had earlier produced tornadoes near Avant, OK and Ramona, OK (numbers 3 and 4).

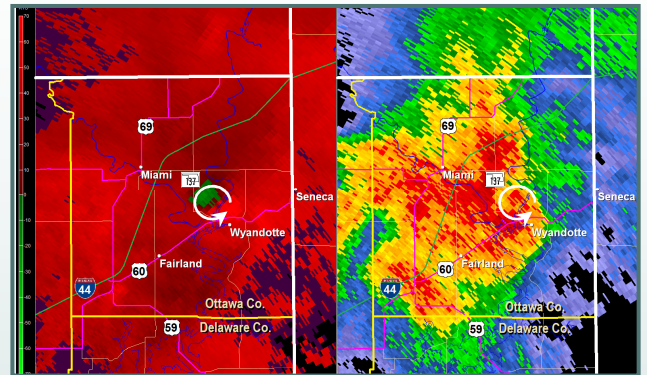
Right: Aerial view of EF-2 tornado damage along Highway 137 in Ottawa Co.



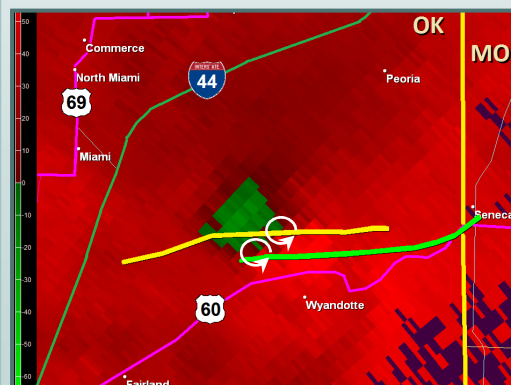
May 19-20, 2013 Surveyed Tornadoes

Doppler's View

NWS Tulsa survey teams found two damage paths in Ottawa County (see related story) from the May 20th tornadoes. So, did radar support this? It turns out, if you look VERY close, it does!



The reflectivity and storm-relative velocity images above show a broad mesocyclone and "hook" echo passing north of Wyandotte, close to where one witness reported seeing two separate tornadoes.



If we zoom in on the mesocyclone, there appear to be two embedded smaller circulations close to the surveyed tornado tracks. While

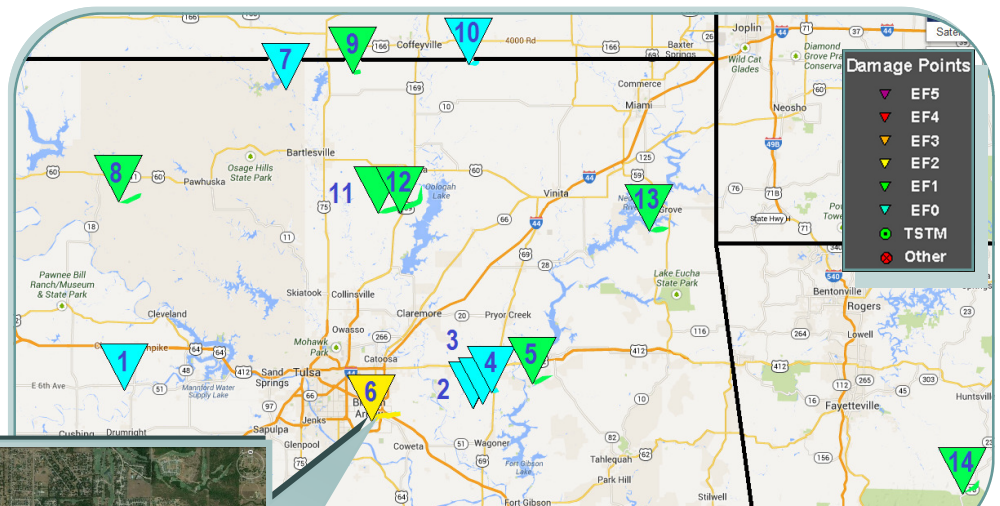
this type of feature would be difficult to pick out in real time, it does give further support to identifying two tornadoes with this storm.

Confirmed Tornadoes May 30-31, 2013

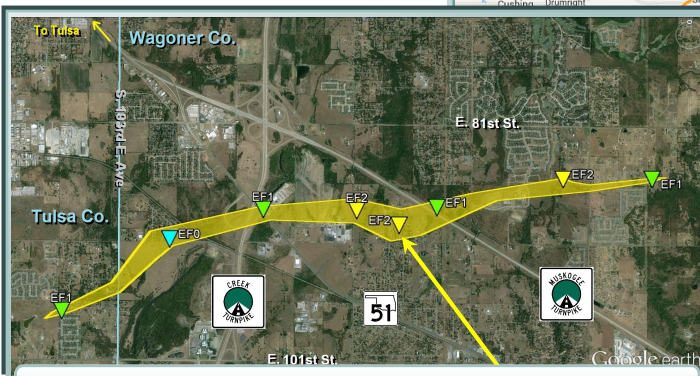
Time	County	Location	Length	Width	Wind	Remarks
May 30						
1 401 pm	Creek	3.5 NNW Oilton	0.1 mi	50 yd	unk	No known damage; chaser reported brief touch down over open country
2 649 pm	Mayes	4.3 SW Mazie	0.1 mi	50 yd	unk	No known damage; chaser reported brief touch down over open country
3 654 pm	Mayes	2 WSW Mazie	0.1 mi	50 yd	unk	No known damage; chaser reported brief touch down over open country
4 708 pm	Mayes	0.5 SSW Mazie - 0.5 SE Mazie	0.6 mi	100 yd	unk	No known damage; reported over open country by several chasers
5 724 pm	Mayes	2 SE Murphy - 3 ESE Murphy	2.1 mi	200 yd	105 mph	Trees snapped/uprooted
6 840 pm	Tulsa/Wagoner	2 SSE Broken Arrow - 2 NE Oneta	5.6 mi	450 yd	135 mph	Numerous homes and businesses damaged, some severely
May 31-June 1						
7 618 pm	Osage	2 NW Hulah	0.1 mi	50 yd	unk	No known damage; chaser reported brief touch down over open country
8 630 pm	Osage	15 WSW Pawhuska - 12.6 WSW Pawhuska	2.5 mi	200 yd	95 mph	2 power poles snapped; path estimated
9 638 pm	Washington, OK	6.8 NE Copan - 7.9 NE Copan	1.2 mi	200 yd	95 mph	1 home damaged; trees uprooted
10 721 pm	Nowata	10.4 SSE S. Coffeyville - 11.1 E S. Coffeyville	1.1 mi	310 yd	85 mph	Trees damaged
11 821 pm	Rogers/Nowata	4.4 NNW Talala - 1.3 SW Watova	3.5 mi	320 yd	110 mph	Trees snapped/uprooted
12 827 pm	Rogers/Nowata	4.9 NNE Talala - 2.7 ENE Watova	4.8 mi	350 yd	110 mph	2 Injured ; Mobile home, barn destroyed; several homes damaged
13 1123 pm	Delaware	5 SW Grove - 4 SSW Grove	1.8 mi	500 yd	100 mph	Trees snapped/uprooted
14 154 am	Madison	1 NE St. Paul - 2 NE St. Paul	1 mi	250 yd	110 mph	Roof off of mobile home; 2 barns damaged; 1 home slightly damaged



Tornado approaching the south side of Broken Arrow, OK on May 30, 2013. Photo courtesy of KRMG.



May 30-June 1, 2013 Surveyed Tornadoes

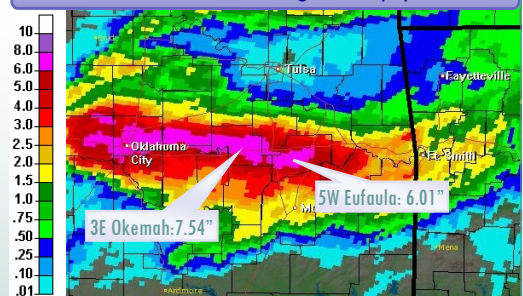


Broken Arrow EF-2 Tornado - 5/30/13

Right: One of several homes significantly damaged by the tornado in Broken Arrow, OK. The second floor walls collapsed, indicating expected winds of 132 mph, or high-end EF-2 damage.



24-hour Rainfall Ending 7AM 6/1/2013



The same supercell storm that produced the damaging tornadoes on the west side of Oklahoma City continued to track east and became an extremely efficient rain maker. Nearly 10 inches of rain fell in parts of the Oklahoma City area, with a 6 to 8 inch swath extending near I-40 through eastern Oklahoma.

DAMAGE

(Continued from page 1)

Making a complete survey of one tornado track can take several hours, depending on road accessibility, weather conditions, etc.

Ottawa County...Two tornadoes?

Ed and I started the day by driving up I-44 through a steady rain to assess damage reported in Ottawa County. Radar had shown an intense circulation that tracked from south of Miami to the Missouri border near Seneca. The actual survey began along state highway 125 north of Fairland, bringing us near the starting point of the mesocyclone track. A few limbs were downed along the way, but nothing indicative of a tornado. After turning east on county road E140, about 4 miles north of Fairland, we saw the first obvious signs of a tornado less than a mile up the road, as a number of large trees were snapped and uprooted...indicative of EF-1 strength. Unfortunately, our progress was halted a short distance later by a large tree across the road.

After backtracking south and finding a way across the river, we turned north onto state highway 137. It was there we encountered significant damage near the intersection with E130 road. A wide swath of tree damage would help us determine the path width...about 800 yards...and several homes and a metal shop building had been heavily damaged. A closer look at the buildings damaged would yield a more detailed assessment. Most of the damage to the homes involved roof covering, chimneys and garage doors...not quite enough to go beyond EF-1 (86-110 mph). However, behind one house, a

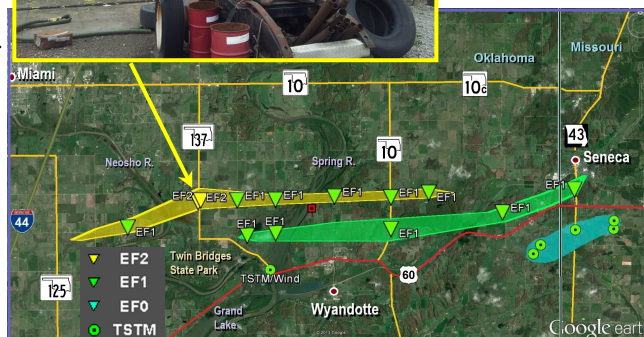
small barn was completely leveled, and the shop building across the road exhibited some failure of the building columns, implying an expected wind speed of 112-118 mph. Thus, this tornado could now be rated an EF-2 (111-135mph).

We were unable to go east on E130 road as crews worked to replace downed power poles, so we had to find another route east. Things got complicated as we mostly encountered cropland and very little in the way of damage indicators. Heading

After a snack break at Wyandotte, we turned back north to an area where the store clerk had notified us about some damage to her property. After noting more downed trees along the way, we came to the end of the road, where residents were cleaning debris from their property along the east side of the Spring River above Grand Lake. One of them reported seeing two tornadoes...one passed just to his north, with a second one a little to the south a few minutes later. It was now clear there were two tornado paths in Ottawa County.



The vertical support column at the center of this metal building (left) shows signs of structural failure. This was rated EF-2 damage as a result.



Damage Paths: Ottawa County 5/20/13

farther south, mainly looking for another place to cross the river, we noticed another swath of tree damage and a few damaged mobile homes a mile or so south of where we expected to. Could there be another tornado path? We were starting to think so as we got back on Highway 137 and drove south toward Twin Bridges State Park. There was also some tree damage in the park, but it appeared to be from straight-line wind.

Turning back east on E130 road, we saw several more downed trees for a mile or so to the east of Highway 10, but after making a slight jog north, we lost the damage path a few miles west of Seneca, Mo. This was determined to be the end of tornado number one; about 10 miles from its starting point.

Now it was after 4 pm and light rain started to fall again. But, we still needed to evaluate the second path. Driving back south on State Highway 10, we saw the two distinct damage paths again. This time the southern path was considerably wider, so we made a couple of trips back up and down the highway and determined a path width of about 600 yards. After turning east on U.S. Highway 60 toward the state line, we were out of the damage path, but did find a few homes with roof damage less than a

Damage Continues on page 7

DAMAGE

(Continued from page 6)

mile to the north along E134 road... indicative of more EF-1 damage. We drove into Seneca and found additional tree damage, including one on a house, on the south side of town.

After coordinating with the NWS Springfield office and the Newton County, Mo. Emergency Manager, the tornado path was ended at Seneca, as no damage was noted to the east of town. However, as we drove south out of town, more trees were down in a separate swath that extended back into Ottawa County. Could this be a third tornado track?

As it turns out, the damage was not as concentrated, and the trees all seemed to have fallen in roughly the same direction. The likely scenario was straight-line winds on the south flank of the storm...not unlike what we saw at Twin Bridges. Further study of radar data later supported this hypothesis.

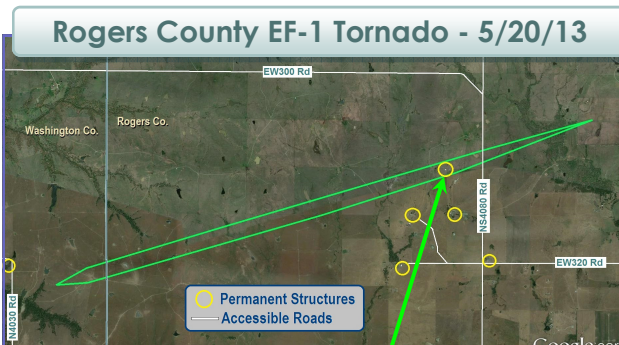
Rogers County...Limited Access

With evening closing in, our sights were set on the tornadoes reported northwest of Tulsa as we made our way home. It was a race against daylight, but the sun broke through to give us the maximum daylight possible. Given several chaser reports of tornadoes and a persistent supercell track across Osage, Washington and Rogers counties, we expected to find damage somewhere. But, this area has a lot of open ranch land, and not a lot for a tornado to hit.

After studying the radar data to figure out where we thought the end point

may be, we drove west to Chelsea, OK, and crossed Oologah Lake north of Talala, OK. There were no signs of damage near U.S. 169 or in the area immediately west of there. And, it was here we ran into a different issue...a lack of roads! If you look at a detailed road map, you may notice an area in extreme northwest Rogers County where there are no roads for about five miles in either direction,

lying in the surrounding pasture; clue number one. The house did have roof damage and the chimney was laying on the ground...an actual damage indicator! There was also significant damage to a large metal outbuilding behind the house, and several windows were blown out of the house. All of these indicated expected gusts of 95-105 mph, or EF-1 damage.



This tornado was photographed by several witnesses, but remained mostly over open grassland with few accessible roads. The path length is an estimate based on radar data, and the width is an estimate based on chaser video.



The EF-1 rating was based on the home pictured above...the only structure damaged by the twister.

aside from some gated ranch access. It turns out; this is precisely where the tornado tracked...just our luck!

So, despite many chaser reports and all sorts of live video of a tornado on the ground, we were about to rate this an EF-0, due to a lack of damage indicators, and call it good. But, as we drove back south along county road NS4080, Ed spotted a house far off the road with a blue tarp on the roof. We turned back and went up the long driveway to the home, observing several pieces of sheet metal

Now we had to determine the path, which would not be an easy task as the sun was about to set and roads were sparse. There was not much to indicate damage along NS4080, so the path likely ended near the house. Driving back west on EW300 and turning south on NS4030 five miles later, we found no other damage. Thus, the path was mainly located within that "road-free" region of Rogers County. The actual path would be derived from chaser video and radar data, but

at least we had a more representative EF-scale rating to document.

Darkness soon overcame us, so we had to save the other tornadoes in Washington and Osage counties for a later day. The final tally for us was three tornadoes surveyed, and about 12 hours of time on the road. With several other tornadoes to be surveyed, additional teams would go out over the next week to finally document all of the tornadoes from May 19 and 20...just in time for the next round! ⚡

DAMAGING DERECHO

The first half of July 2013 was hot and dry, with the second half bringing periods of heavy rain and cooler temperatures. But, as is often the case with summer storms, relief from the heat comes at a price...and this was definitely true in the late evening of July 23 and very early morning of the 24th.

Severe thunderstorms developed during the late afternoon over central and southern Kansas. Meanwhile, the airmass was extremely hot and unstable south of these storms, where afternoon heat indices topped out between 108 and 112 degrees in many areas of eastern Oklahoma. An upper-level disturbance moved southeastward dur-

ing the evening, and helped organize a complex of severe storms, which moved through eastern Oklahoma between 10pm and 3am.

The severe storms had already produced damaging wind gusts up to 80 mph in the Wichita area, and did not slow down as the complex moved into northeast Oklahoma and eventu-

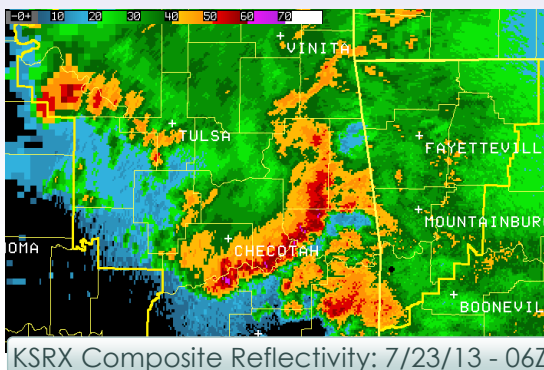
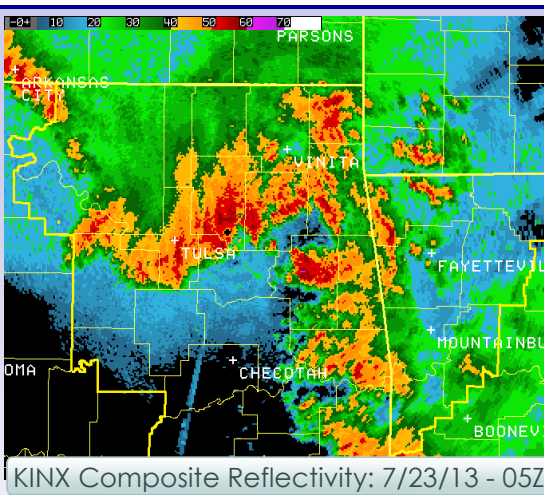
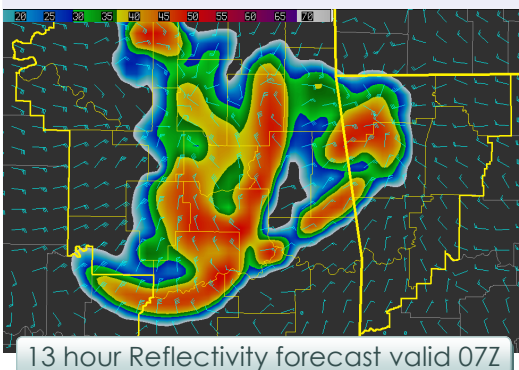
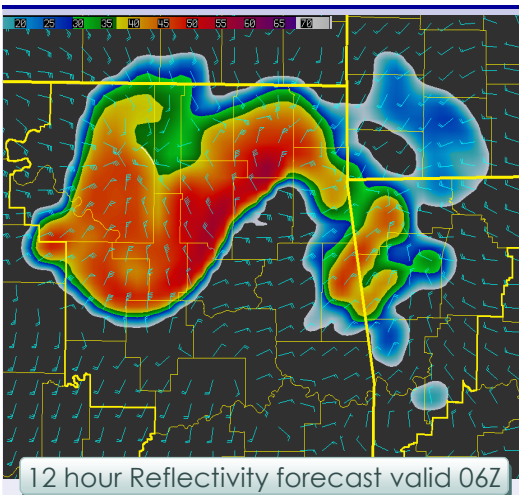
What is a Derecho?

A derecho (pronounced similar to "deh-REY-cho") is a widespread, long-lived wind storm. Derechos are associated with bands of rapidly moving showers or thunderstorms variously known as bow echoes, squall lines, or quasi-linear convective systems.

By definition, if the swath of wind damage extends for more than 240 miles, includes wind gusts of at least 58 mph along most of its length, and several, well-separated 75 mph or greater gusts, then the event may be classified as a derecho.

ally the Tulsa metropolitan area. Several locations reported winds of over 70 mph, including a 76 mph wind

Derecho Continues on page 9



Local Forecast Model

A few years ago, the NWS in Tulsa began to experiment with running numerical forecast models on a local scale. With continued research and development, the local model has shown considerable skill in forecasting the evolution of convective systems such as the one on July 23.

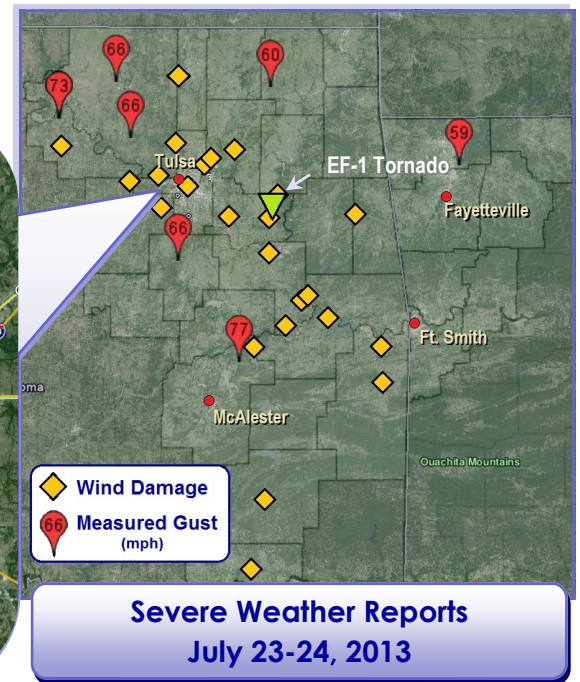
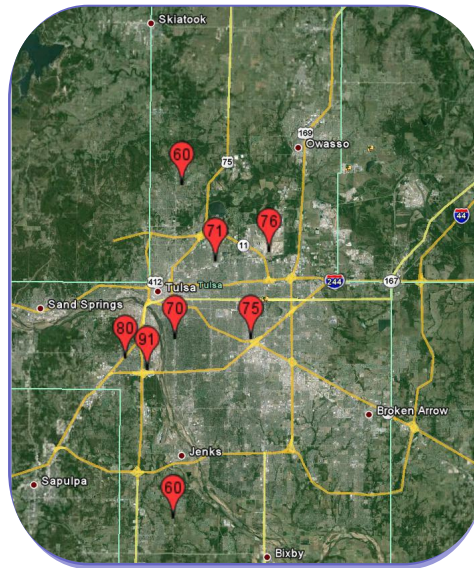
At left is a comparison of the forecast reflectivity from the local model that was run at 18z (1 pm CDT) on the 23rd, which showed a complex of storms would dive southeast across eastern Oklahoma into western Arkansas between 1 am and 3 am. The arrival of the storms was about an hour earlier than the model forecast, but the location was nearly spot on!

DERECHO

(Continued from page 8)

gust at Tulsa International Airport...the highest ever recorded at the official site. A swath of damaging winds pushed across Tulsa and surrounding areas, causing widespread tree and power line damage and leaving over 100,000 without power during the overnight and early morning hours.

As the line of storms moved southeast, an EF-1 tornado developed about 3 miles west of downtown Wagoner, where it produced minor damage to trees and outbuildings. As it moved southeast and crossed Highway 51, it severely damaged a large metal building and destroyed portions of two wood-framed storage units. Several homes had roof and siding damage as well. The tornado continued to produce minor damage to homes and light tree damage until it neared Highway 69. There, a travel trailer was blown 35 yards, more homes and several businesses received roof damage.



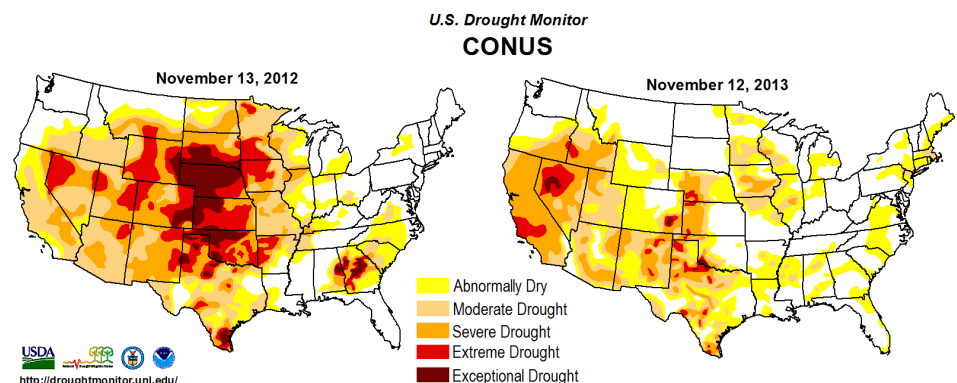
The complex continued to produce damaging wind gusts as it pushed southeast, finally reaching Choctaw County shortly after 2am.

Farther east, a persistent area of moderate to heavy rainfall lingered much of the night. The heaviest rains fell along the Oklahoma-Arkansas border where between 3 to 5 inches fell. Some flooding was reported in both Tahlequah and Miami.

Much Better!

Thanks to a cooler and wetter summer this year, along with some timely fall rains, drought conditions have all but been erased in eastern Oklahoma and western Arkansas as we head into winter. As of November 12, only a portion of Choctaw county was still considered to be in a "moderate" drought, and a small area east of Tulsa was considered "abnormally dry".

If you recall one year ago at this time, we were all under at least a "severe" drought, and "extreme" drought cov-

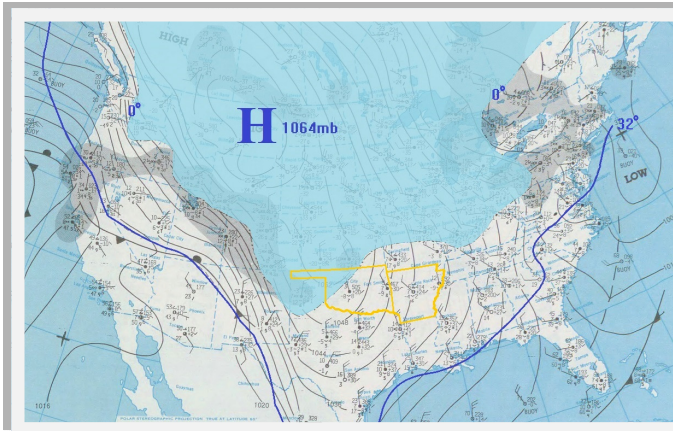


ered roughly half of the area. Better yet, drought conditions have eased considerably throughout the plains states and parts of the southeast.

Unfortunately, portions of far western Oklahoma just can't seem to catch a break and remain in "extreme" to "exceptional" drought.

Arctic Outbreak of 1983

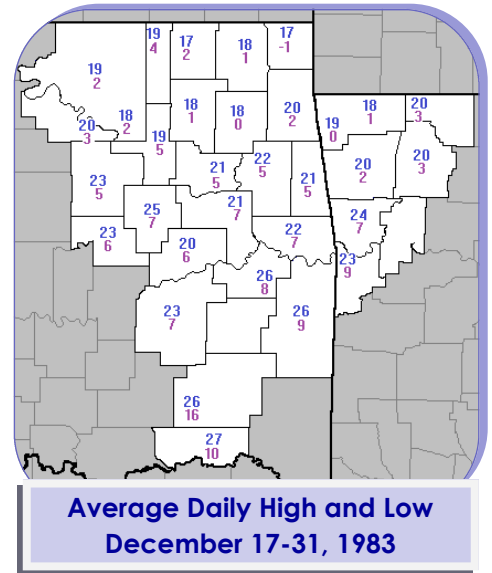
Thirty years ago this month, one of the most prolonged period of bitter cold weather gripped much of the nation, and led to a Christmas season that will not easily be forgotten by those who experienced it. The last two weeks of December, 1983, was one of the coldest stretches of weather on record across eastern Oklahoma and western Arkansas, with temperatures running 25 to 35 degrees below normal most days.



Surface Weather Map at 6 AM CST 12/24/1983. The 1064 mb pressure reading at Miles City, MT is the highest ever measured in the continental United States.

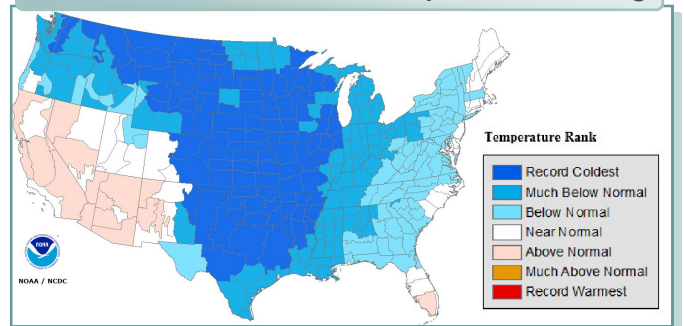
The initial surge of arctic air plunged south into the area by the 18th, with even colder air settling in by Christmas Eve. The arctic high was arguably the strongest to ever impact the lower 48, with a surface pressure of 1064 millibars measured in eastern Montana, a record that

still stands. Temperatures fell below zero in many locations by Christmas eve, with daytime highs barely managing to warm above zero across northeast Oklahoma and north-west Arkansas.



Temperatures would eventually plunge as low as -16 at Hulah Dam (Osage Co.) on December 30, before the arctic air finally began to modify in time for the new year.

December 1983 Divisional Temperature Ranking



Nearly one-third of the continental U.S. saw its coldest December on record in 1983 as arctic air gripped the nation most of the month.

BE SAFE HEATING YOUR HOME!

Space Heaters

- ✱ About two-thirds of home heating fire deaths are caused by portable or fixed space heaters.
- ✱ Place space heaters at least three feet away from anything combustible.
- ✱ Never leave space heaters on when you leave the room or when you go to bed. Don't leave children or pets unattended near space heaters.
- ✱ Never use space heaters to dry wet clothing.

Ovens

- ✱ Never use a kitchen stove or outdoor cooking grill for supplemental heat.

Fireplaces and Wood Stoves.

- ✱ Use a sturdy screen when burning fires.
- ✱ Burn only seasoned hardwood.
- ✱ Have your chimney connections and flues inspected by a professional and cleaned if necessary.

Generators

- ✱ Never operate a portable generator inside your home, including the basement or garage.
- ✱ Do not hook up a generator directly to your home's wiring...connect the equipment you want to power directly to the outlets on the generator.

- ✱ Never connect a cord from a generator to a point on the permanent wiring system.
- ✱ Don't overload electrical outlets. Be careful of extension cords that present hazardous walkways.

Carbon Monoxide

- ✱ Install at least one CO alarm near sleeping areas.
- ✱ Have a trained professional inspect, clean and tune-up your home's central heating system and repair leaks or other problems.
- ✱ Keep gas appliances properly adjusted and serviced.